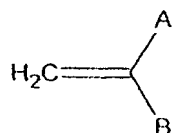


## CLAIMS

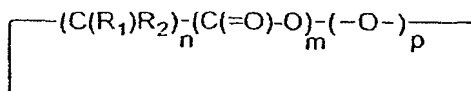
1. A solid support comprising at least one electrically conducting and/or semiconducting region  
5 containing a reducible oxide on its surface, characterized in that at least one zone of said surface is functionalized with an electrografted organic film obtained from electroactive organic precursors each comprising at least one functional group of interest,  
10 optionally in a mixture with electroactive organic precursors not comprising a functional group of interest, and in that the number of functional groups of interest accessible for the formation of a covalent, ionic or hydrogen bond with a complementary group  
15 within said film represents at least 90% of the total number of functional organic groups of interest.

2. The support as claimed in claim 1, characterized in that the organic precursors are chosen from:  
20 - polymerizable and electrograftable monomers bearing at least one organic functional group of interest;  
- polymerizable and electrograftable monomers bearing at least one functional group making it possible to obtain, by derivatization, the desired reactive  
25 functional organic group of interest;  
- molecules, macromolecules and objects functionalized with monomers bearing at least one organic functional group of interest or with monomers bearing at least one functional group making it possible to obtain, by  
30 derivatization, the desired reactive functional organic group of interest.

3. The support as claimed in claim 2, characterized in that the polymerizable monomers are chosen from  
35 activated vinyl monomers and molecules that are cleavable by nucleophilic attack, corresponding respectively to formulae (I) and (II) below:



(I)



(II)

in which:

- A, B, R<sub>1</sub> and R<sub>2</sub>, which may be identical or different, represent a hydrogen atom, a C<sub>1</sub>-C<sub>4</sub> alkyl radical, a nitrile radical or an organic function chosen from the following functions: hydroxyl, amine: -NH<sub>x</sub> with x = 1 or 3, thiol, carboxylic acid, ester, amide: -C(=O)NH<sub>y</sub> in which y = 1 or 2, imide, imidoester, aromatic, acid halide: -C(=O)X in which X represents a halogen atom chosen from fluorine, chlorine or bromine, acid anhydride: -C(=O)OC(=O), nitrile, succinimide, phthalimide, isocyanate, epoxide, siloxane: -Si(OH)<sub>z</sub> in which z is an integer between 1 and 3 inclusive, benzoquinone, carbonyldiimidazole, para-toluenesulfonyl, para-nitrophenyl chloroformate, ethylene and vinyl, or an organic group (or spacer arm) bearing at least one of the functions listed above; it being understood that at least one of A and B and that at least one of R<sub>1</sub> and R<sub>2</sub> represents one of said organic functions or an organic group bearing at least one of said functions;
- n, m and p, which may be identical or different, are integers between 0 and 20 inclusive.

4. The support as claimed in claim 3, characterized in that the activated vinyl monomers of formula (I) are chosen from methacryloyl succinimide, hydroxyethyl methacrylate, methacrylonitrile, acrylonitrile, glycidyl acrylate and glycidyl methacrylate, acrylic acid, methacrylic acid, aminopropylmethacrylamide, aminohexylmethacrylamide, methacryloyl succinimide, acryloyl succinimide, methyl methacrylate, ethyl methacrylate, propyl methacrylate, butyl methacrylate, methyl cyanomethacrylate, methyl cyanoacrylate, 2- and 4-vinylpyridine and 4-chlorostyrene.

5. The support as claimed in claim 3, characterized in that the molecules that are cleavable by nucleophilic attack, of formula (II), are chosen from  
5 ethylene oxide, substituted ethylene oxides, butyrolactone, caprolactones and in particular  $\epsilon$ -caprolactone.

6. The support as claimed in claim 2, characterized  
10 in that the molecules, macromolecules and objects functionalized with monomers are chosen from oligonucleotides, nucleic acid molecules, oligopeptides, polypeptides, proteins, oligosaccharides, polymers, fullerenes, functionalized  
15 carbon nanotubes, and cells; said molecules, macromolecules and said objects being derivatized, totally or partially, with monomers corresponding to formulae (I) or (II) as defined in claim 3.

7. The support as claimed in any one of the preceding  
20 claims, characterized in that the electrically conducting or semiconducting surface is a stainless steel, steel, iron, copper, nickel, cobalt, niobium, aluminum, silver, titanium, silicon, titanium nitride,  
25 tungsten nitride or tantalum nitride surface, or a noble metal surface chosen from gold, platinum, iridium or platinum-iridium alloy surfaces.

8. The support as claimed in any one of the preceding  
30 claims, characterized in that the density of the accessible functional groups of interest is preferably between  $10^4/\mu\text{m}^2$  and  $10^{10}/\mu\text{m}^2$ .

9. A process for preparing a support as defined in  
35 any one of claims 1 to 8, characterized in that it consists in carrying out, in a single step, the electrografting of electroactive organic precursors onto at least one zone of at least one electrically conducting and/or semiconducting region containing a

reducible oxide on its surface, of a solid support, by electrolysis, in an organic medium, of a composition containing, in said organic medium, at least one electroactive organic precursor comprising at least one functional group of interest, by bringing said composition into contact with said zone, the latter being subjected to a potential protocol during which it is brought, for all or part of the potential protocol, to a potential greater than or equal to a threshold electrical potential determined relative to a reference electrode, said threshold electrical potential being the potential beyond which the grafting of said precursors occurs, and in that a degree of accessibility of functional groups of interest of at least 90% (by number) is obtained:

- a) by adjusting the potential protocol so as to produce a degree of grafting of less than or equal to 60%, and/or
- b) by using a composition in which the functionalized electroactive organic precursors are present in a mixture with electroactive organic precursors not comprising a functional group of interest, the latter then representing from 0.1 to 95% of the total number of precursors present in said composition, and/or
- c) by using electroactive organic precursors chosen from those in which the functional group of interest is borne at the end of a spacer arm.

10. The process as claimed in claim 9, characterized in that the degree of grafting is adjusted to a value of between 10 and 40%.

11. The process as claimed in claim 9 or 10, characterized in that, according to variant b), the electroactive organic precursors not comprising a functional group of interest represent from 0.1 to 50% of the total number of precursors present in said composition.

12. The process as claimed in any one of claims 9 to 11, characterized in that the concentration of electroactive organic precursors comprising a functional group of interest is between 0.1 and 10 mol/l.

13. The process as claimed in any one of claims 9 to 12, characterized in that the concentration of electroactive organic precursors not comprising a functional group of interest in said organic composition is between  $10^{-3}$  and 18 mol/l.

14. The process as claimed in any one of claims 9 to 13, characterized in that the electrolysis is carried out under voltametric conditions.

15. The process as claimed in any one of claims 9 to 14, characterized in that the organic medium is chosen from dimethylformamide, ethyl acetate, acetonitrile and tetrahydrofuran.

16. The process as claimed in any one of claims 9 to 15, characterized in that the organic medium also contains at least one support electrolyte.

17. The use of a solid support as defined in any one of claims 1 to 8, as an adhesion primer for attaching molecules of interest or objects bearing a complementary function.

18. The use as claimed in claim 17, characterized in that the molecules of interest are proteins and in that said support is then used as a bioactive surface or as a protein chip.

19. The use as claimed in claim 17, characterized in that the molecules of interest are nucleic acid

molecules and in that said support is then used as a bioactive surface or as a nucleic acid chip.

5 20. The use as claimed in claim 17, characterized in that the molecules of interest or the objects bearing a complementary function are chosen from biocompatible polymers and in that said support is then used as a biocompatible surface or as a surface with encapsulating properties.

10

21. The use of a solid support as defined in any one of claims 1 to 8, for bonding objects to conducting or semiconducting surfaces by means of surface chemical reactions.